

WHAT IS CLAIMED IS:

1. A method in a data processing system having a program, the method comprising the steps performed by the program of:

monitoring in real-time a plurality of signals that each describe an operating condition

5 of a subject data processing system;

determining whether there is a problem with the subject data processing system by comparing at least one of the monitored signals to a corresponding at least one signal in a known signal dataset, the known signal dataset comprising a signal value for at least one signal that describes an operating condition of one of a plurality of subject data processing

10 systems; and

preparing a new signal dataset having an entry for each monitored signal and a corresponding signal value simultaneously with monitoring the plurality of signals and determining whether there is a problem.

15 2. The method according to claim 1, further comprising the steps of:

choosing the known signal dataset from a plurality of known signal datasets; and
retrieving the chosen known signal dataset.

3. The method according to claim 2, wherein the known signal dataset is chosen

20 from the plurality of known signal datasets as having one of an exact match and a nearest match to the monitored signals of the subject data processing system among the plurality of known signal datasets.

4. The method according to claim 3, wherein the known signal dataset's at least

25 one signal is an exact match to the monitored signals of the subject data processing system.

5. The method according to claim 3, wherein the known signal dataset's at least one signal is a nearest match to the monitored signals of the subject data processing system.

30 6. The method according to claim 2, wherein the known signal dataset is chosen using a set theory operator.

7. The method according to claim 1, further comprising the step of:

after preparing the new signal dataset, replacing the known signal dataset with the new signal dataset, wherein the monitored signals are compared to the new signal dataset.

5 8. The method according to claim 1, further comprising the step of:
storing the new signal dataset with the plurality of known signal datasets.

9. The method according to claim 1, wherein the monitored signals include at least one of physical variables of a physical status of the subject data processing system, performance variables of a performance of the subject data processing system, and canary variables of user transaction times with the subject data processing system.

10 10. The method according to claim 9, wherein the monitored signals include at least one of a temperature, a voltage, a current, a vibration, an environmental variable, a time-domain reflectometry reading, a load on a CPU, a load on a and memory, a throughput, a 15 queue length, a bus saturation, a FIFO overflow statistic, an input/output traffic value, a security value, a memory utilization, a cache utilization, and a wait time.

11. The method according to claim 1, wherein the known signal data set and the new signal dataset include an ordered triple of variables.

20 12. The method according to claim 11, wherein the ordered triple of variables includes physical variables, performance variables, and canary variables.

13. The method according to claim 1, wherein a pattern recognition method is 25 used to determine whether there is a problem with the subject data processing system.

14. The method according to claim 13, wherein the pattern recognition method is at least one of a multivariate state estimation technique, nonlinear nonparametric regression algorithm, a neural network, a component analysis method, an adaptive method based on a 30 Kalman filter, and a method based on an autoregressive moving average.

15. A computer-readable medium containing instructions that cause a data processing system having a program to perform a method comprising the steps performed by the program of:

monitoring in real-time a plurality of signals that each describe an operating condition of a subject data processing system;

5 determining whether there is a problem with the subject data processing system by comparing at least one of the monitored signals to a corresponding at least one signal in a known signal dataset, the known signal dataset comprising a signal value for at least one signal that describes an operating condition of one of a plurality of subject data processing systems; and

10 preparing a new signal dataset having an entry for each monitored signal and a corresponding signal value simultaneously with monitoring the plurality of signals and determining whether there is a problem.

16. The computer-readable medium according to claim 15, further comprising the steps of:

15 choosing the known signal dataset from a plurality of known signal datasets; and retrieving the chosen known signal dataset.

17. The computer-readable medium according to claim 16, wherein the known signal dataset is chosen from the plurality of known signal datasets as having one of an exact match and a nearest match to the monitored signals of the subject data processing system
20 among the plurality of known signal datasets.

18. The computer-readable medium according to claim 17, wherein the known signal dataset's at least one signal is an exact match to the monitored signals of the subject data processing system.

25 19. The computer-readable medium according to claim 17, wherein the known signal dataset's at least one signal is a nearest match to the monitored signals of the subject data processing system.

30 20. The computer-readable medium according to claim 16, wherein the known signal dataset is chosen using a set theory operator.

21. The computer-readable medium according to claim 15, further comprising the step of:

after preparing the new signal dataset, replacing the known signal dataset with the new signal dataset, wherein the monitored signals are compared to the new signal dataset.

22. The computer-readable medium according to claim 15, further comprising the
5 step of:

storing the new signal dataset with the plurality of known signal datasets.

23. The computer-readable medium according to claim 15, wherein the monitored
signals include at least one of physical variables of a physical status of the subject data
10 processing system, performance variables of a performance of the subject data processing
system, and canary variables of user transaction times with the subject data processing
system.

24. The computer-readable medium according to claim 23, wherein the monitored
15 signals include at least one of a temperature, a voltage, a current, a vibration, an
environmental variable, a time-domain reflectometry reading, a load on a CPU, a load on a
and memory, a throughput, a queue length, a bus saturation, a FIFO overflow statistic, an
input/output traffic value, a security value, a memory utilization, a cache utilization, and a
wait time.

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25. The computer-readable medium according to claim 15, wherein the known
signal data set and the new signal dataset include an ordered triple of variables.

26. The computer-readable medium according to claim 25, wherein the ordered
25 triple of variables includes physical variables, performance variables, and canary variables.

27. The computer-readable medium according to claim 15, wherein a pattern
recognition method is used to determine whether there is a problem with the subject data
processing system.

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28. The computer-readable medium according to claim 27, wherein the pattern
recognition method is at least one of a multivariate state estimation technique, a nonlinear
nonparametric regression algorithm, a neural network, a component analysis method, an

adaptive method based on a Kalman filter, and a method based on an autoregressive moving average.

29. A data processing system comprising:

5 a memory having a program that

monitors in real-time a plurality of signals that each describe an operating condition of a subject data processing system,

determines whether there is a problem with the subject data processing system by comparing at least one of the monitored signals to a corresponding at least one signal in a 10 known signal dataset, the known signal dataset comprising a signal value for at least one signal that describes an operating condition of one of a plurality of subject data processing systems, and

15 prepares a new signal dataset having an entry for each monitored signal and a corresponding signal value simultaneously with monitoring the plurality of signals and determining whether there is a problem; and

a processing unit that runs the program.

30. The data processing system according to claim 29, wherein the program

further choose the known signal dataset from a plurality of known signal datasets and 20 retrieves the chosen known signal dataset.

31. The data processing system according to claim 30, wherein the known signal dataset is chosen from the plurality of known signal datasets as having one of an exact match and a nearest match to the monitored signals of the subject data processing system among the 25 plurality of known signal datasets.

32. The data processing system according to claim 31, wherein the known signal dataset's at least one signal is an exact match to the monitored signals of the subject data processing system.

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33. The data processing system according to claim 31, wherein the known signal dataset's at least one signal is a nearest match to the monitored signals of the subject data processing system.

34. The data processing system according to claim 30, wherein the known signal dataset is chosen using a set theory operator.

35. The data processing system according to claim 29, wherein the program
5 replaces the known signal dataset with the new signal dataset after preparing the new signal dataset, and wherein the monitored signals are compared to the new signal dataset.

36. The data processing system according to claim 29, wherein the program further stores the new signal dataset with the plurality of known signal datasets.

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37. The data processing system according to claim 29, wherein the monitored signals include at least one of physical variables of a physical status of the subject data processing system, performance variables of a performance of the subject data processing system, and canary variables of user transaction times with the subject data processing
15 system.

38. The data processing system according to claim 37, wherein the monitored signals include at least one of a temperature, a voltage, a current, a vibration, an environmental variable, a time-domain reflectometry reading, a load on a CPU, a load on a
20 and memory, a throughput, a queue length, a bus saturation, a FIFO overflow statistic, an input/output traffic value, a security value, a memory utilization, a cache utilization, and a wait time.

39. The data processing system according to claim 29, wherein the known signal
25 data set and the new signal dataset include an ordered triple of variables.

40. The data processing system according to claim 39, wherein the ordered triple of variables includes physical variables, performance variables, and canary variables.

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41. The data processing system according to claim 29, wherein a pattern recognition method is used to determine whether there is a problem with the subject data processing system.

42. The data processing system according to claim 41, wherein the pattern
recognition method is at least one of a multivariate state estimation technique, a nonlinear
nonparametric regression algorithm, a neural network, a component analysis method, an
adaptive method based on a Kalman filter, and a method based on an autoregressive moving
5 average.

43. A data processing system comprising:

means for monitoring in real-time a plurality of signals that each describe an
operating condition of a subject data processing system;

10 means for determining whether there is a problem with the subject data processing
system by comparing at least one of the monitored signals to a corresponding at least one
signal in a known signal dataset, the known signal dataset comprising a signal value for at
least one signal that describes an operating condition of one of a plurality of subject data
processing systems; and

15 means for preparing a new signal dataset having an entry for each monitored signal
and a corresponding signal value simultaneously with monitoring the plurality of signals and
determining whether there is a problem

44. A computer-readable memory device encoded with a program having a data
20 structure with a plurality of entries, the program run by a processor in a data processing
system, each entry comprising:

a signal data of a monitored operating condition of a monitored data processing
system, the program storing the signal data in the entry while simultaneously determining
whether there is a problem with the monitored data processing system by comparing the
25 signal data to a corresponding entry in a second data structure, the second data structure
having a plurality of entries that each describe an operating condition of one of a plurality of
monitored data processing systems.